



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS & INTERFERENCES

Serial No.: 10/657,085

Group Art Unit: 1753

Inventors: Perrot et al

Filed: September 9, 2003

Title: **METHOD OF MANUFACTURING
AN EXTENDED LIFE SPUTTER
TARGET ASSEMBLY AND
PRODUCT THEREOF**

Examiner: R. G. McDonald

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is a brief in support of an appeal from the decision of the Examiner dated June 16, 2006, finally rejecting Claims 1-6, 8-12 and 14-17, which are reproduced as an Appendix to this brief. A Notice of Appeal was filed on December 15, 2006 together with a three-month extension of time.

The Commissioner is authorized to charge any fees that may be required with this paper, and to credit any overpayment to Deposit Account No. 16-2440.



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I. REAL PARTY IN INTEREST

The real party in interest is Praxair S.T. Technology, Inc., the assignee of record.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences that have a direct affect or are directly affected by or have a bearing on the Board's decision in the pending appeal.

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III. STATUS OF CLAIMS

Claims 1-6, 8-12 and 14-17 are pending. All of these claims are the subject of the present appeal. A copy of the claims is set forth in Appendix A.

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IV. STATUS OF AMENDMENTS

An amendment is filed concurrently herewith to introduce into independent claims 9 and 14 substantially the same recitation which is found in independent claim 1, and which has been previously considered by the Examiner.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to the field of recessed sputter targets and particularly to a method of manufacturing recessed sputter targets (Specification at paragraph 1). More particularly, it concerns a sputter target having improved yield and the requisite bond between the target insert and the backing plate so as to increase the sputter target material utilization. As a result, the overall costs associated with the frequent design, manufacturing and changes of the sputter target assembly in the sputtering apparatus are reduced (Specification at paragraph 5). Further, the overall bond provides a satisfactory solid state bond between the target insert and the backing plate of similar and dissimilar materials (Specification at paragraph 7).

Through the invention, Appellants have provided a method of manufacturing a sputter target assembly. The method includes the step of (a) manufacturing a backing plate, the backing plate having a planar top surface and a cylindrical recess therein, the recess having a depth and a diameter, and the backing plate having a yield strength; (b) manufacturing a near final shape target insert, wherein the target insert has a frusta-conical rear surface that corresponds to the cylindrical recess of the backing plate and a frusta-conically configured front surface, wherein at least about fifty percent of the front surface is frusta-conically configured, the target insert further having a yield strength greater than that of the backing plate, and a height greater than the depth of the cylindrical recess in the backing plate; and (c) hot pressing the target insert into the cylindrical recess of the backing plate to a state of plastic deformation so as to diffusion bond the target insert to the backing plate and form the target assembly, where the target insert protrudes above the planar front surface of the backing plate (Claim 1, Specification at paragraph 9 and Fig. 4).

According to another aspect of the invention a sputter target assembly is provided. The assembly includes a cylindrical backing plate, the cylindrical backing plate having a planar front surface and a recess within the front surface; and a target insert having a height greater than the depth of the recess of the backing plate. The target insert has a frusta-conically configured front surface and a rear surface, the rear surface having at least about fifty percent of its surface area conical-shaped and the rear surface is bonded to the backing plate to secure the target insert to the backing plate, wherein the recess is plastically

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deformed to the shape of the target insert, to form the target assembly and where the target insert protrudes above the planar front surface of the backing plate (Claim 9, Specification at paragraph 10 and Figures).

In a further aspect of the invention, a sputter target assembly is provided. The assembly includes a cylindrical backing plate, the cylindrical backing plate having a planar front surface and a recess within the front surface; and a target insert bonded to the backing plate within the recess of the backing plate. The target insert has a frusta-conical shaped front surface which protrudes above the planar top surface of the backing plate and a frusta-conical shaped rear surface. The rear surface has at least about sixty percent of its surface area conical-shaped and the rear surface is bonded to the backing plate to secure the target insert to the backing plate and form the target assembly, wherein the recess is plastically deformed to the shape of the target insert, to form the target assembly (Claim 14, Specification at paragraph 11, and Figures).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether the Specification is properly objected to under 35 U.S.C. §132(a) as allegedly introducing new matter which is not supported by the original disclosure.

2. Whether claims 1-6, 8-12 and 14-17 are properly rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Hunt et al '405 (U.S. Patent No. 6,599,405 B2) in view of Hunt et al '367 (U.S. Patent No. 5,674,367) and Bilz (German Patent Document 1 50 482).

VII. ARGUMENTS

First Ground of Rejection

As noted above, the first ground of rejection is whether the Specification is properly objected to under 35 U.S.C. §132(a) as allegedly introducing new matter which is not supported by the original disclosure.

The Examiner's Rationale

According to page 2 of the Official Action of June 16, 2006:

"The added material which is not supported by the original disclosure is as follows: 'wherein at least about 50 percent of the front surface has the frusta-conical configuration.' Applicants are required to cancel the new matter in the reply to this Office Action."

The Argument

Originally, the Examiner only rejected the claims as allegedly failing to comply with the written description for the exact same recitation, which is the subject of the current objection on appeal. See Official Action of October 13, 2005 at page 2. Thereafter, the rejection of the claims was withdrawn, and instead the present objection to the Specification was made. Given the interrelationship between the withdrawn rejection and the present objection over the same recitation, this objection is ripe for the Board of Appeals to consider.

The proscription against introduction of new matter in a patent application serves to prevent applicants from adding information that goes beyond the subject matter originally filed. See *In re Rasmussen* 211 USPQ 323, 326 (CCPA 1981). In this regard, the Figures unequivocally form part of the Specification as originally filed. As shown in Figure 4, of Appellants' Specification, the sloped region of the front surface exceeds the flat portion. Thus, clearly the frusta-conical portion is at least fifty percent.

Moreover, a description as filed is presumed to be adequate, unless or until sufficient evidence or reasoning contrary has been presented by the Examiner to rebut the presumption. See *In re Marzocchi*, 439 F.2d 220, 169 USPQ 367 (CCPA 1971). Here the burden of proof has not been carried. In fact, in rejecting the present claims the Examiner asserts that figures of the applied

document Bilz allegedly disclose a frusta-conical configuration of the target being at least fifty percent. Therefore, it is inconsistent on the one hand to object to drawings which are described in Appellants' Specification, while on the other rely on the prior art drawings as allegedly being sufficiently descriptive to reject the claims. Accordingly, for the foregoing reasons reversal of this objection is in order and it is respectfully requested.

Second Ground of Rejection

The second ground is whether claims 1-6, 8-12 and 14-17 were properly rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Hunt et al '405 (U.S. Patent No. 6,599,405 B2) in view of Hunt et al '367 (U.S. Patent No. 5,674,367) and Bilz (German Patent Document 1 50 482).

The Examiner's Rationale

"Regarding Applicants' claims 1, 9 and 14, Hunt et al '405 teach [sic] a method of manufacturing a sputter target (See Abstract) comprising the steps of manufacturing a backing plate (Column 1 lines 61-62), the backing plate having a cylindrical recess having a depth and a diameter and a yield strength of a target insert. (Column 1 lines 61-66). Final Official Action at page 3. The differences between Hunt et al '405 and the present claims is that the target insert protruding above the planar front surface of the backing plate is not discussed (Claims 1, 9, 18) the front surface of the target has a frusta-conical configuration is not discussed (Claims 1, 9, 14) and wherein at least fifty percent of the front surface is frusta-conically configured is not discussed (Claim 1). (Emphasis added). Final Official Action at page 5.

Regarding the target insert protruding above the planar front surface of the backing plate, Hunt et al '367 teaches a circular target. (Column 3 lines 4-6). Final Official Action at page 5.

Regarding wherein at least about fifty percent of the front surface is frusta-conically configured, Bilz teach [sic] in the Figure a target front surface which has at least 50 percent of the front surface frusta-conically configured. The sloped portions are greater than the flat portion of the target. (See Bilz Fig. 1) (Emphasis added). Final Official Action at page 5."

The Argument

The Examiner always has the burden under 35 U.S.C. §103 to first establish a *prima facie* case of obviousness. *In re Fine*, 5 USPQ2d 1596, 1598

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(Fed. Cir. 1988). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination. *In re Geiger*, 2 USPQ2nd 1276, 1278 (Fed. Cir. 1987); MPEP §706.02(j). Here the appropriate legal standards have not been met.

Hunt et al '405 is directed to a method of manufacturing a sputter target assembly and to a target assembly. See the claims. As noted by the Examiner, Hunt et al '405 simply does not disclose or fairly suggest a frusta-conically shaped target surface protruding above the planar top surface of the backing plate.

Hunt et al '367 is directed to an apparatus for sputtering thin films onto a substrate, and more particularly, to a sputtering target having a mounted ring which is shrink fit onto the sputtering target. See Col. 1, lines 5-10. Hunt et al '367, has been relied on for the alleged disclosure shown in Fig. 7 to cure the deficiencies in Hunt et al '405.

While Hunt et al '367 discloses that side wall 37 of target 38 is tapered, it is designed to increase the integrity of the target rather than extend the life of the target. Moreover, it must be emphasized that in Hunt et al '367 it is not the sputtering surface 40 which is tapered, but the side wall 37. In stark contrast, in the present invention material is added to the front surface of the target, rather than tapering the side walls. In addition, the material is added in a frusta-conical configuration to the front surface of the target, over at least about fifty percent of the front surface of target, so as to extend the target life. These features and benefits are not even remotely suggested by Hunt et al '367.

In what appears to be a concession that Hunt '405 and Hunt '367 do not disclose the claimed invention, Bilz has been added to the rejection for allegedly supplying the missing feature. Bilz is directed to a magnetron with a cathode, wherein the cathode is provided with a surface which slopes downward toward the periphery. See English Abstract. Specifically, Bilz has been applied for the alleged disclosure of a frusta-conically configured front (i.e., sputter surface) target. It appears that the Examiner has picked one isolated feature of Bilz and combined it with Hunt et al '367 and Hunt et al '405 to arrive at the claimed invention. This position is improper for a number of reasons.

First, Bilz does not even concern the manufacturing of a sputter assembly, where the target is affixed into a backing plate. Second, Bilz does not disclose the claimed process of hot pressing a target insert into the backing plate to a state of plastic deformation so as to diffusion bond these elements. Third, Bilz does not concern the thickness of the target assembly, but rather the uniformity of the film applied on the substrate. As discussed above, Bilz does not even appear to teach a backing plate, much less the process of manufacturing presently claimed. The teaching or suggestion to make the claimed combination (as well as the expectation of success) must be found in the prior art, and not based on the Appellants own disclosure. *In re Vaeck*, 20 USPQ2d 1438 (Fed. Cir. 1991). Here, absent improper hindsight gleaned from Appellants own Specification there would be absolutely no motivation to pick this isolated feature in Bilz and combine it with Hunt et al in an effort to arrive at the claimed invention. Accordingly, the claimed subject matter would not have been obvious over any combination of Hunt et al '367, Hunt et al '405 or Bilz.

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VIII. CONCLUSION

In view of the foregoing, Appellants respectfully submit that no new matter has been introduced into the Specification. Further, the claimed method of manufacturing a sputtering target and the product manufactured thereby would not have been obvious over any combination of Hunt et al '367, Hunt et al '405 or Bilz. Accordingly, reversal of the Examiner's objection and rejection is earnestly solicited.

Respectfully submitted,



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CERTIFICATE OF MAILING UNDER 37 CFR 1.8
I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on March 2, 2007.

Signature: Christina Mommens
Christina Mommens

CLAIMS APPENDIX

1. A method of manufacturing a sputter target assembly comprising the steps of:
 - a) manufacturing a backing plate, the backing plate having a planar top surface and a cylindrical recess therein, the recess having a depth and a diameter, and the backing plate having a yield strength;
 - b) manufacturing a near final shape target insert, wherein the target insert has a frusta-conical rear surface that corresponds to the cylindrical recess of the backing plate and a frusta-conically configured front surface, wherein at least about fifty percent of the front surface is frusta-conically configured, the target insert further having a yield strength greater than that of the backing plate, and a height greater than the depth of the cylindrical recess in the backing plate; and
 - c) hot pressing the target insert into the cylindrical recess of the backing plate to a state of plastic deformation so as to diffusion bond the target insert to the backing plate and form the target assembly, where the target insert protrudes above the planar front surface of the backing plate.
2. The method of claim 1 wherein at least fifty percent of the frusta-conical rear surface bonds to the backing plate.
3. The method of claim 1 including the additional step of maintaining temperature of the target insert and backing plate above 200°C for at least one hour to improve bonding between the frusta-conical rear surface of the target insert and the backing plate.
4. The method of claim 1 wherein the pressing of the target into near final shape includes consolidating a powder into the target insert.
5. The method of claim 1 wherein the cylindrical recess has a volume and the target insert has a volume; and the cylindrical recess has a volume between about ninety and about one-hundred percent of the volume of the target insert.

6. The method of claim 1 wherein the cylindrical recess has a volume and the target insert has a volume; and the cylindrical recess has a volume approximately equal to the volume of the target insert.

8. The method of claim 1, wherein the cylindrical recess is disposed in a portion of the planar top surface of the backing plate.

9. A sputter target assembly comprising:

a cylindrical backing plate, the cylindrical backing plate having a planar front surface and a recess within the front surface; and

a target insert having a height greater than the depth of the recess of the backing plate, the target insert having a frusta-conically configured front surface, wherein at least about fifty percent of the front surface is frusta-conically configured and a rear surface, the rear surface having at least about fifty percent of its surface area conical-shaped and the rear surface being bonded to the backing plate to secure the target insert to the backing plate, wherein the recess is plastically deformed to the shape of the target insert, to form the target assembly and where the target insert protrudes above the planar front surface of the backing plate.

10. The sputter target of claim 9 wherein the recess has a shape conformed to the shape of the target insert.

11. The sputter target of claim 9 wherein a reaction product between the target insert and the backing plate bonds the target insert to the backing plate.

12. The sputter target of claim 9 wherein a conical interface bonds the target insert to the backing plate.

14. A sputter target assembly comprising:

a cylindrical backing plate, the cylindrical backing plate having a planar front surface and a recess within the front surface; and
a target insert bonded to the backing plate within the recess of the

backing plate, the target insert having a frusta-conical shaped front surface which protrudes above the planar top surface of the backing plate, wherein at least about 50 percent of the front surface is frusta-conically configured, and a frusta-conical shaped rear surface, the rear surface having at least about sixty percent of its surface area conical-shaped and the rear surface being bonded to the backing plate to secure the target insert to the backing plate and form the target assembly, wherein the recess is plastically deformed to the shape of the target insert, to form the target assembly.

15. The sputter target of claim 14 wherein the recess has a shape conformed to the shape of the target insert.

16. The sputter target of claim 14 wherein a reaction product between the target insert and the backing plate bonds the target insert to the backing plate.

17. The sputter target of claim 14 wherein a frustum interface and a conical interface bond the target insert to the backing plate.

RELATED PROCEEDINGS APPENDIX